In the Claims:

1. (Currently Amended) A method for producing a boride layer on a surface by plasma boronizing comprising the steps of:

supplying a gas mixture containing a boron-releasing gas to a treatment chamber of a reactor;

generating a glow discharge in the reactor;

determining an amount of at least one excited boron-releasing gas product selected from excited boron and excited BCI particles in the glow discharge; and

selecting production parameters of the plasma generated in the treatment chamber of the reactor and one or more process parameters selected from at least one of voltage, pulse duty factor, frequency, temperature and pressure, depending on the determined amount of the excited boron-releasing gas product so as to maintain at least one of: at least one of a minimum value and a maximum value of the determined excited boron-releasing gas product, and at least one of a minimum value or a maximum value of a relation of one or more of the determined amount of the excited boron-releasing gas product to another glow discharge product so as to produce the boride layer on the surface.

2. (Previously presented) A method according to claim 1, wherein said step of generating the glow discharge in the reactor comprises using a pulsed DC voltage source having a ratio of voltage pulse duration to subsequent pulse pause duration which is greater than 1.1:1.

3. (Previously presented) A method according to claim 1 wherein said step of generating [a] the glow discharge in the reactor comprises applying a DC voltage in pulses having a pulse period of less than 230 μs.

4. (Previously presented) The method according to claim 1, further comprising:

during a first stage, generating the glow discharge in the reactor while maintaining the gas mixture at a selected treatment temperature to first produce said boride layer and prevent formation of halogenides which cause formation of pores, and

during a second stage that is performed after the first stage, maintaining the gas mixture at a higher temperature than the selected temperature.

5 - 7. (Cancelled)

8. (Original) A method according to claim 2 wherein the glow discharge is generated by applying a DC voltage in pulses having a pulse period of less than 230 μs

9. (Previously presented) A method according to claim 2 wherein the method includes a first stage during which the gas mixture is maintained at a selected temperature to prevent formation of halogenides which cause formation of pores to first produce said boride layer, followed by a second stage during which the gas mixture is maintained at a higher temperature.

10. (Previously presented) A method according to claim 3 wherein the method includes a first stage during which the gas mixture is maintained at a selected temperature to prevent formation of halogenides which cause formation of pores to first produce said boride layer followed by a second stage during which the gas mixture is maintained at a higher temperature.

11. (Previously presented) A method according to claim 1 including determining the amount of the excited boron-releasing gas in the reactor at least in a relative manner.

12. (Original) A method according to claim 11 including determining spectroscopically the amount of excited boron-releasing gas in the reactor.

13. (Original) A method according to claim 11 including determining the amount of excited boron in the reactor at least as a function of the amount of excited boron-releasing gas in the reactor.

14. (Cancelled)

15. (Previously presented) A method according to claim 1 wherein said supplied gas mixture comprises boron trihalide as the boron-releasing gas product in a concentration greater than about 1% by volume, along with hydrogen gas and, optionally, a noble gas.

16. (Previously presented) A method according to claim 4 wherein the glow discharge is generated by applying a pulsed DC voltage which has a ratio of the voltage pulse duration to the subsequent pulse pause duration in the range from about 1.1:1 to 5:1 ratio.

17. (Original) A method according to claim 16 wherein the ratio is in the range from about 1.5:1 to 3.5:1.

18. (Previously presented) A method according to claim 4 further comprising generating the glow discharge using a pulsed DC voltage having a pulse period of less than about 210 μs.

19. (Original) A method according to claim 18 wherein the pulsed DC voltage has a pulse period ≥ 50 μs.

20. (Original) A method according to claim 19 wherein the voltage of the pulsed DC voltage used for generating the flow discharge in the range between about 500 volts and about 1000 volts.

21. (Previously presented) A method according to claim 20 wherein the pulsed DC voltage is in the range between about 650 volts and about 800 volts.

22. (Previously presented) A method according to claim 1 wherein the reactor pressure is maintained in a pressure range between about 0.5 and about 15 hPa.

23. (Original) A method according to claim 22 wherein the reactor pressure is maintained in the range between about 1 and about 10 hPa.

24. (Previously presented) A method according to claim 1 wherein the gas mixture contains a boron trihalide in a concentration of between 2% by volume and about 50% by volume.

25. (Original) A method according to claim 24 wherein the boron trihalide concentration is between about 2% by volume and about 10% by volume.

26. (Previously presented) A method according to claim 1 wherein the gas mixture contains up to 20% by volume of a noble gas and 2% by volume to 50% by volume of boron trihalide, the remainder being hydrogen gas.

27. (Previously presented) A method according to claim 1 wherein the gas mixture contains more than 0% and up to 20% by volume of argon and 2% by volume to 50% by volume of boron trihalide, and wherein the remainder of the gas mixture is a hydrogen gas.

28. (Original) A method according to claim 26 wherein the gas mixture contains 2% by volume to 20% by volume of boron trihalide.

29. (Previously presented) A method according to claim 1 wherein the boron-releasing gas is one of BCl_3, BF_3 and mixtures thereof.

30 – 39 (Cancelled)

40. (Currently Amended) A method for producing a boride layer on a surface by plasma boronizing comprising the steps of:

supplying a gas mixture containing a boron-releasing gas to a treatment chamber of a reactor;

generating a glow discharge in the reactor;

determining a first amount of at least one excited boron-releasing gas product selected from excited boron and excited BCI particles in the glow discharge;

selecting first values for production parameters of the plasma generated in the treatment chamber of the reactor and one or more process parameters selected from at least one of voltage, pulse duty factor, frequency, temperature and pressure, depending on the first determined amount of the excited boron-releasing gas product so as to maintain at least one of: at least one of a minimum value and a maximum value of the excited boron-releasing gas product, and at least one of a minimum value or a maximum value of a relation of one or more of the amount of the first determined excited boron-releasing gas product to another glow discharge product to produce the boride layer on the surface;

determining a second amount of at least one excited boron-releasing gas product in the glow discharge; and

returning to the selecting step to be performed using selecting second values instead of the ~~fist~~ first values.

Applicants do not believe that any fees are due at this time; however, should any fees under 37 C.F.R. §§ 1.16 to 1.21 be required for any reason relating to this document, the Commissioner is authorized to deduct the fees from Deposit Account No. 02-0383, *(formerly Baker & Botts, L.L.P.,)* Order Number (070255.0590).

If the Examiner feels that a telephone conference or an interview would advance prosecution of this Application in any manner, the undersigned agent for Applicant stands ready to conduct such a conference at the convenience of the Examiner.

Respectfully submitted,

Date: January 26, 2004

By:_____

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